

ACTIONI/Q[®] Q446

MODEL

CE

Benefits

- Adjustable Bridge Excitation 1 to 10V with up to 120mA drive
- Eleven Field Configurable Input Ranges from 10mV to $\pm 200\text{mV}$ (0.5mV/V to $>50\text{mV/V}$)
- Five Field Configurable Output Ranges: 0-5V, 0-10V, 0-1mA, 0-20mA and 4-20mA
- TouchCAL Technology for Easy Non-Interactive Zero and Span Adjustments and TARE
- SnapLoc[™], Plug-IN Terminals for Low MTTR
- Universal AC Power 85 to 265 VAC
- ASIC Technology for High Reliability
- Lifetime Warranty



Bridge Input, Field Configurable Signal Isolator

Provides an Isolated DC Output in Proportion to a Bridge/Strain-Gauge Input

DESCRIPTION

The ActionI/Q Q446 is a DIN rail mount, bridge or strain-gage input signal conditioner with 1800VDC isolation between input, output and power. The field configurable input and output offers flexible, wide ranging capability for bridge or strain-gage input applications from 0.5mV/V to over 50mV/V.

Low-cost microprocessor technology has enabled replacement of zero and span adjustment potentiometers with push-button, "TouchCAL[™]" technology. In essence, the thermal drift and mechanical variability of the potentiometers have been removed and replaced with a digitally stable circuit. Additionally, the inherent zero and span interactivity of potentiometer based analog amplifier circuitry is removed, providing 100% non-interactive adjustment.

The field configurable input of the Q446 can be set via DIP switches for any one of 11 voltage ranges from 10mV to $\pm 200\text{mV}$ (see Table 1). The field configurable output is linear to the input and can be set for either 0-5V, 0-10V, 0-1mA or 4-20mA, direct or reverse acting.

TouchCAL technology enables precise calibration and provides more than 90% offset of the zero value and adjustment down to 10% of the full scale input span for most of the 11 switch selectable input ranges. For example, the DIP switch configured 0-100mV input range could be calibrated via push button for 0-40mV (i.e. 60% span reduction) or offset to a range of 60-100mV (i.e. 60% offset and 60% span reduction). If the output was configured for 0-10V, then 60-100mV input would correspond to the 0-10V full scale output. Thus, an input range such as 90-100mV is possible using the 0-100mV range. A TARE function is also provided to allow batch offsets.

Advanced digital technology combined with Action's exclusive ASIC technology allows the Q446 to be field configured for virtually any Bridge input to DC output within the limits specified. Calibration


**ACTION
INSTRUMENTS**

*Protecting the
Integrity of
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utilizes “TouchCAL” technology where the user simply configures the desired input excitation and millivolt range via switches, then applies the minimum and maximum input signals, touching a recessed button to store range values. (i.e. 60% offset and 60% span reduction).

TOUCHCAL™ TECHNOLOGY

The Q446 utilizes Action Instruments’ TouchCAL technology which greatly simplifies calibration. Once the unit is configured via DIP switches, the push-button is used to precisely calibrate the minimum and maximum levels.

To calibrate the input within the DIP switch configured range, the user simply applies the high input signal and pushes the CAL button. The low input signal is then applied and pushing the CAL button again stores the low input signal. Note, these steps are reversed for reverse mode operation.

The high and low input levels are stored in nonvolatile memory and correspond to the high and low output levels. These output levels are precisely adjusted using the input signal.

DIAGNOSTIC LEDES

The Q446 has three diagnostic LEDs. The green LED, labeled RUN, is used for diagnostics to indicate that power is on, and it will flash quickly if the input signal is above the configured range or slowly if the input signal is below range. The RUN LED is continuously on when the unit is functioning within the configured range.

The yellow INLED is on while calibrating the input and the red OUT LED is on while calibrating the output.

This flexibility, combined with an adjustable (1 to 10VDC) bridge excitation source, provides the user a reliable, accurate instrument to isolate and condition virtually any bridge or strain-gage input.

APPLICATION

The ActionI/Q Q446 field configurable, bridge input signal conditioner is useful in isolating ground loops and interfacing bridge sensors to data acquisition and control systems.

Three way isolation completely eliminates ground loops from any source. Isolation protects expensive SCADA systems from ground faults and provides filtering for noise reduction which can be a significant problem with small, millivolt, bridge signals.

Wide ranging flexibility allows the user to easily zero out dead-loads in weighing systems or configure bipolar input ranges for tension-compression or vacuum-pressure bridge applications.

High density DIN rail mounting offers an extremely compact solution for saving valuable panel space.

CONFIGURATION

A major advantage of the Q446 is its wide ranging capabilities and ease of configuration. The Q446 can be configured for input ranges from 10mV to +/-200mV, with 90% input

offset or it will adjust down to 10% of fullscale input span (except on 10mV, +/-5mV range where maximum offset or gain adjustment is 50%).

Unless otherwise specified, the factory presets the Model Q446 as follows:

Input Setting:	0 to 50mV
Input Range:	0 to 30mV (3mV/V)
Excitation:	10V
Operation:	Direct
Output:	4 to 20mA

WARNING: Do not attempt to change any switch settings with power applied. Severe damage will result!

Regarding other I/O ranges, refer to Table 1 for input range (SW1) switch settings, Table 2 for input direction settings, Table 3 for excitation level and Table 4 for output ranges (SW2). For quick and easy calibration mode reference, see the step-by-step flow chart in Figure 1.

1. With power off, snap off the face plate by lifting the right edge, away from the heat sink. Slide off the metal heatsink.
2. Note, the module has two eight position switch blocks, one for input and one for output.
3. Change Dip switches for desired ranges using Tables 1-4. Slide metal piece into original position. Attach face plate before beginning calibration.

Table 1: Input Range Selector-Switch Settings

	SW1				
	1	2	3	4	5
0 to 10mV		■		■	■
0 to 20mV		■	■		
0 to 50mV		■	■	■	■
0 to 100mV	■				■
0 to 200mV	■				■
-5 to 5mV		■			
-10 to 10mV		■	■		■
-20 to 20mV		■	■	■	
-50 to 50mV		■	■	■	■
-100 to 100mV	■				
-200 to 200mV	■				■

Table 2: Direct or Reverse Operation Setting

	SW1
DIRECT	6
REVERSE	■

Table 3: Bridge Excitation Selector-Switch Settings

	SW1
9.8 to 10.1V	7 8
4.8 to 5.2V	■
0 to 10V	■ ■
0 to 2.5V	■

Table 4: Output Range Selector-Switch Settings

	SW2							
	1	2	3	4	5	6	7	8
0 to 5V	■	■	■	■				
0 to 10V	■		■	■				
0 to 1mA			■	■	■			
4 to 20mA						■	■	■
0 to 20mA	■	■			■		■	■

KEY ■ = ON

SPECIFICATIONS

Input	Voltage Input Full Scale Range: 10mV to ± 200 mV (Table 1). Impedance: >1 M Ω Overvoltage: intermittent 400V, max.; continuous 264V, max. Common Mode (Input to Ground): 1800VDC, max. Push-button Adjustment Effective zero offset: $>90\%$ Effective span turn down: $>90\%$ except for 10mV & ± 5 mV range where 50% is maximum zero offset and span turndown Operation: direct or reverse acting	Output Noise (maximum) 0.1% of span, rms, or 10mV whichever is greater.
Output	Voltage Output Output: 0-5V, 0-10V Impedance: $<10\Omega$ Drive: 10mA, max. (1K Ω , min. @ 10V) Current Output Output: 0-1mA, 0-20mA, 4-20mA Impedance: >100 K Ω Compliance: 0-1mA; 7.5V, max. (7.5K Ω , max.) 0-20mA; 12V, max. (600 Ω , max.) 4-20mA; 12V, max. (600 Ω , max.)	Response Time (10 to 90%) <200 ms, typical. Common Mode Rejection DC to 60Hz: 120dB, 100dB (0 -1mA, range) Isolation 1800VDC between input, output and power. EMC Compliance (CE Mark) Emissions: EN50081-1 Immunity: EN50082-2 Safety: EN50178 LED Indication (green) Input Range (approx.) $>110\%$ input: 8Hz flash $<0\%$ input: 4Hz flash Humidity (Non-Condensing) Operating: 15 to 95% (@ 45°C) Soak: 90% for 24 hours (@ 65°C) Temperature Range Operating: 0 to 55°C (32 to 131°F) Storage: -25 to 70°C (-13 to 158°F) Power Consumption: 2.7W typical (one 350 Ω bridge), 5W max. (four 350 Ω bridges). Range: 100-240VAC Shipping Weight 0.54 lbs. Wire Terminations Screw terminals for 12-22 AWG Agency Approvals UL recognized per standard UL508. CSA certified per standard 22.2 No. 0-M91 and 142-M1987. CE Compliance per EMC directive 89/36 EEC and Low Voltage 73/23/EEC.
Bridge	Excitation 1 to 10VDC, 120mA max. Current drive decreases at 10mAV below 5V (e.g. 4V, 110mA max.)	
Accuracy	(Including Linearity, Hysteresis) $\pm 0.1\%$ typical, $\pm 0.2\%$ maximum of selected input range at 25°C.	
Stability	$\pm 0.025\%/^{\circ}\text{C}$ typical, $0.05\%/^{\circ}\text{C}$ maximum, of selected full scale input range.	

CALIBRATION

For best results, calibration should be performed in the operating installation, allowing at least one hour for thermal stability of the system. If pre-calibration on a test bench is preferred, then an output load equal to the input impedance of the device(s) connected to the Q446 output is recommended, along with a 1 hour warm up period.

1. For best results install the module on to a piece of DIN rail or the I/Q Rail mounting accessory if desired. See the I/Q Rail data sheet for details.

Note: An I/Q Rail is required to power the modules. A two position rail is provided. See ordering information.

2. Connect the input to a calibrated DC source and the output to a voltage or current meter. Apply power and allow the system to reach thermal equilibrium (approx. 1 hour).

3. Adjust the input signal to the desired maximum and observe that the green LED is on or flashing. Push the CAL button and hold it down for six flashes of the yellow LED, until the yellow and green LEDs are flashing, then release the button.

Note 1: To quit the calibration mode and reset the unit, push the CAL button again and hold for more than 5 seconds, again. Or, wait for more than two minutes and the unit will time-out and automatically reset to the previously stored calibration.

Note 2: For reverse operating mode (SW1-6, closed), input the minimum signal in step 4 of calibration.

4. The yellow and red LEDs should be on. Push the CAL button. Apply the exact maximum input signal level desired, if not already applied, then push the CAL button to store. The yellow LED should now be on.

Note: For reverse operating mode (SW1-6, closed), input the maximum signal in step 5 of calibration.

5. Apply the exact minimum input signal level desired, then push the CAL button to store. The green and red LED should now be on.

6. Adjust the input signal up, until the output is precisely at the desired maximum level (e.g. 20.00mA), then push the CAL button to store. The red LED should now be on.

7. Adjust the input signal level down, until the output is precisely at the desired minimum level (e.g. 4.00mA), then push the CAL button to store. The yellow, green and red LEDs should now be on.

8. To finish calibration, push the CAL button one final time. The green LED should be on if the input is within the calibrated range.

Note: The TARE function is enabled by depressing the TARE/(CAL) until the yellow LED flashes at least once and less than six times and release. This will make the present input as the TARE value and the output will be the minimum output when the module was calibrated.

ASSISTANCE:

For additional information on calibration, operation and installation please contact our Technical Services Group. Call toll free:

800-783-6664

- Y** Yellow LED **Y** Off
- G** Green LED **Y** On
- R** Red LED **Y** Flash

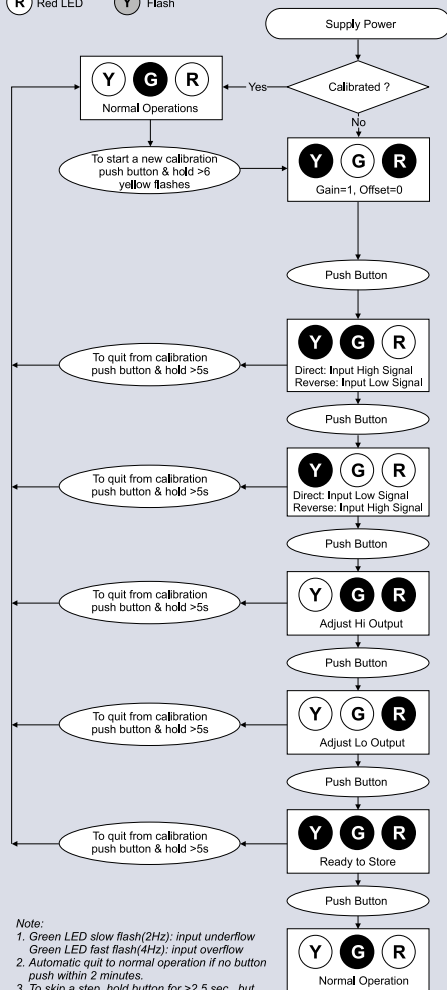


Figure 1: Q446 Calibration Flow Chart.

DIMENSIONS

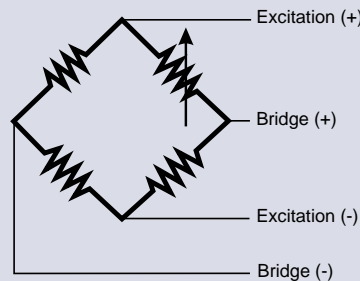
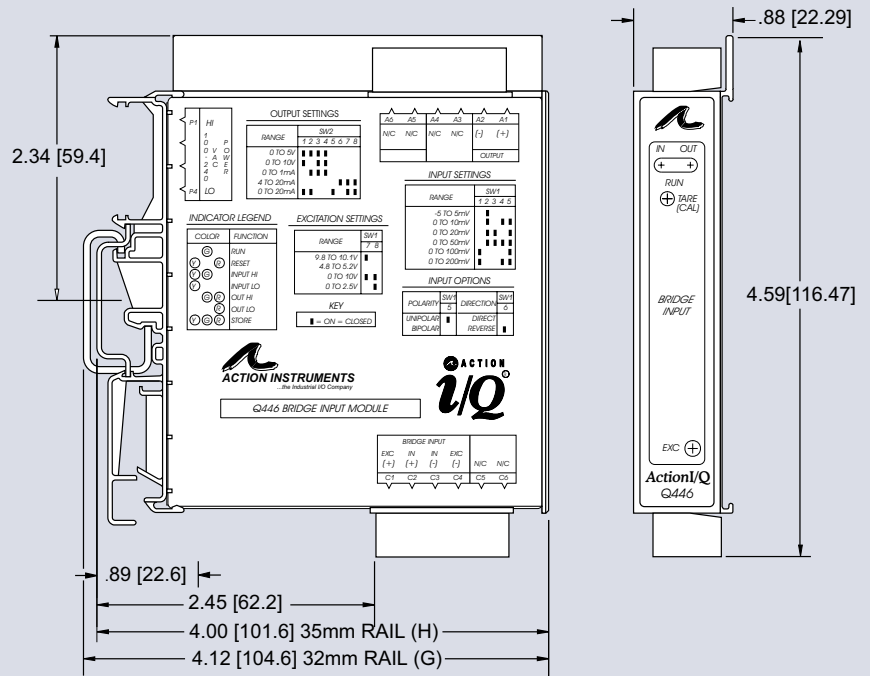


Figure 2: Bridge Reference Designations

MODELS & ACCESSORIES

Accessories

All *ActionIQ* modules mount on standard TS32 (model MD02) or TS35 (model MD03) DIN rail. In addition the following accessories are available:

MD02	TS32 DIN rail
MD03	TS35 x 7.5 DIN rail
IQRL-2002	2 Position I/QRail & DIN rail
IQRL-2004	4 Position I/QRail & DIN rail
IQRL-2008	8 Position I/QRail & DIN rail

Ordering Information

Specify:

- Model: **Q446-0000**;
- Specify optional I/QRail, type and quantity. **(1 IQRL-2002 per module, no charge)**
- Accessories: (see Accessories)
- Optional Factory Custom Calibration, specify **C620** - with desired input and output ranges.

Terminal Connections

- A1: DC Output (+)
- A2: DC Output (-)
- A3: Not Used
- A4: Not Used
- A5: Not Used
- A6: Not Used
- C1: Bridge Excitation (+)
- C2: Bridge Input (+)
- C3: Bridge Input (-)
- C4: Bridge Excitation (-)
- C5: Not Internally Connected
- C6: Not Internally Connected
- P1: AC (Line) Power
- P2: Not Used
- P3: Not Used
- P4: AC (Neutral) Power